SABEL Ed

Enabling technologies for education from SABEL Labs

Enhancing the practical education experience using low cost technologies for the classroom, laboratory. Ideal for distance and online education modalities where hands-on learning is essential.

The SABEL Ed Advantage

With the costs and competitiveness of delivering tertiary level education courses rising, SABEL education offers technologies based on low cost, hand held computing solutions to deliver courses with substantially lower operating costs, and at a fraction of capital cost to not only maintain the bottom line, but also offers an enhanced student experience and the opportunity to bring a practical laboratory environment for those unable to study in a face to face environment.

Todays students rate flexibility in course delivery highly. Traditional on campus students now make up only 50% of the student body and with over 60% of them engaged in employment. SABEL Ed provides at home flexibility.

Distance and Online is an area largely unexplored student cohort by the technical disciplines

Why SABEL?

SABEL Labs has almost two decades experience in training Australia's elite athlete community, by using the latest disruptive technologies. Today we bring these to the technical disciplines and the classroom. Deputy director Dr David Rowlands developed and trialled the technology in 3 different technology and programming courses and has successfully replaced traditional teaching laboratories with SABEl Ed!

Benefits

Reduce costs   Reduce your laboratory costs to $1/10^{th}$ of what they are now

Servicing   Reduced reliance on central computing support and license costs

Agility   Response to the changing demands of flexible teaching with agility

Hands on   Run a hands on practical laboratory at your site or theirs

Real or virtual   Cheap enough to pop in the mail or access virtually

SABEL Labs: An intraprenurial enterprise of Griffith University
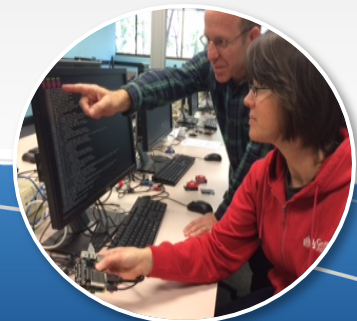
Three educational scenarios…What's your need?

Changing economic and social climates are challenging traditional education models and budgets that need to deployed by the University and other sectors.

1. Enhanced Traditional Environment

Replacing computers in a laboratory with SABEL Ed results in an approximate 90% saving per station in capital and servicing costs. Students will attend laboratory sessions as they do now. This will still require demonstrators but the saving can be used to put directly to the teaching, not the equipment. Perhaps a call centre for their course at night which is when the students do their preparation for the labs and their reflection on the work done in the laboratory. "Demonstrator Kiosk". (Their time on campus is already busy – especially engineers who typically have over 20 contact per week)

2. Distance Education

The cost of SABEL Ed is low, there are no licensing costs, which will enable a distance education model to be adopted. SABEL Ed approaches a 'disposable' costs and can be mailed out their laboratory including course notes and assessment materials.

> The advent of low cost, open source disruptive computing solutions has the potential to redefine the way we teach students in the future.
> *Dr David Rowlands*

This enables students from remote locations, or who cannot attend face to face technical courses due to economic and/or working commitments. We see that this model can be applicable to the mining sector who have a lot of Fly-in Fly-out work, workers with unusual hours (shift) and those considering a return to work who cannot upskill due to the rigid timing constraints of traditional courses.

3. Online Education

This technology can be applied to an online environment, in a similar manner to distance education. By using a web interface to the SABEL Ed 'lab bank' on campus, students can manipulate the experimental environment through the web. Thus immersing the remote student to a real lab environment (and the practical skills that come with it) without being restricted to the campus hours. This would enable some of the more practical courses which need a "hands-on" real world feel to enter the online education domain. Using collaberation tools, laboratory and tutorial assistants can be available to supervise student through self guided experiments as budgets permit.

Whatever your needs our solutions can be customised to match you facilities, workforce and online environments.

Case study: Embedded and Programming laboratories

Prior to 2015, the Engineering teaching laboratory consisted of 32 desktop computers. At the start of 2015, these computers were at end of their life and needed replacement which meant the school was looking at the substantial capital cost of replacing 32 computers. This required a rethink of the teaching model employed by the school. In 2015, a teaching model using SABEL Ed was successfully developed and adopted by the Engineering school. These were used to replace the desktop computers in the laboratory. This case study is based around the change.
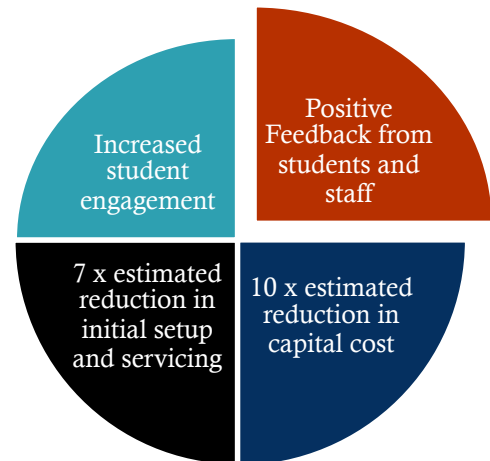
Two courses were trialed. A C programming course and a highly specialized computing course involving writing embedded OS and device driver creation. As part of the C programming course, the students could also program additional embedded systems (an Arduino).

The capital cost for the laboratory resulted in an estimated 10x cost reduction where two labs could be fully replaced for the cost equivalent of about 2-3 desktop units. The setup and running costs including image creation, image deployment, testing, and servicing were estimated to result in a 7x cost reduction.

The feedback about the system was positive. The laboratory technical support were extremely enthused with the concept and implementation. The students were equally positive about the move to SABEL Ed in the lab and many students bought their own to practice/prepare for the laboratories. We were supportive of this. It is also great to hear the students discussing what they were going to do with their SABEL Ed after the course.

Overall, this new teaching/laboratory model was successful so now the model will be deployed in other laboratories in the school.

The SABEL Ed Solution

The SABEL Ed solution is based around a low cost OEM computing platform (RPi) and linux OS sub system that has been customised. The advantages of this this solution are:

1. Cost per unit is low compared to a full PC/laptop/tablet.

2. Scalable solution which is easy to upgrade as technology advances

3. Fully open source means no licensing issues.

4. Affordable for students. They can buy one and use our prepared images so they have exactly the same environment at home as they have at university.

5. Extremely customisable with access to the wide variety of tools and apps developed by the open source community.

6. Multimedia capable platform

7. Useful connectivity (Ethernet, USB built-in). Can use USB connected devices eg Bluetooth, wireless etc to enhance connectivity.

8. Full user friendly desktop environment.

9. Access to the lowest level hardware elements for deep embedded technology education

10. Access to the user OS tools and programming environments for different style of courses.

11. Most of the time top end computing power is not required to do the teaching. This means that the low cost platforms can be used to replace some of the existing laboratories.

12. The teaching academic can have full control over the image without relying upon external groups to continually adapt the image

13. Quick turn around and replacement in the teaching environment. If things go wrong with the platform, then it is cheap enough to have some spares so that it can be quickly swapped. This improves the student experience since issues can be dealt with quickly.

14. Unbrickable platformwhich means that the students can get to the lower technical levels without fear of breaking the device.

15. It encourages "Experiential Learning" since the students can tinker with the technology outside of class.
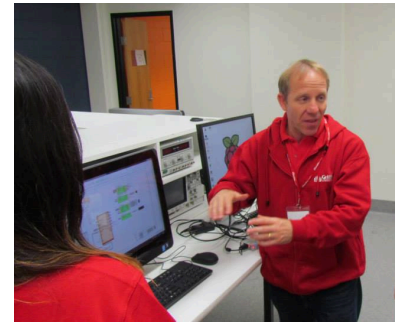
SABEL Ed Roadmap

The solution is tailored to be rolled out in phases to mature each process.

1. Concept
2. Traditional Rollout
   a. Single course
   b. Single semester
3. Distance Rollout
   a. Single course
   b. Single Semester
4. Online Rollout
   a. Single Course
   b. Single Semester
5. Multiple courses
   a. Different course types and year groups
   b. Different campuses

Overall, SABEL Ed offers the disruptive technology advantage to traditional educational practices of teaching instructions, with scalable lower costs and enhanced delivery.

For More information

SABEL Education

Dr. David Rowlands, Dep. Director SABEL

+61 (0)7 3735 5036, david@sabellabs.com

A/Prof Daniel James, Director SABEL

+61 (0)7 3735 5036, dan@sabellabs.com

Mail

SABEL Labs

Griffith University

170 Kessels Road

Queensland, AUSTRALIA

Welcome to SABEL Labs. SABEL Labs is an internal enterprise and research laboratory at Griffith University in Brisbane. We have over a decade of experience in developing wearable and online technologies to enhance sports performance, as tools for health and in providing R & D services to the professional sports and consumer industries.